

## Original Article

## The Role of Mediator of Cognitive Emotion Regulation Strategies in the Relationship between Mindfulness and Perceived Stress in People with High Blood Pressure

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(Received: 6 May 2019; Revised: 29 May 2019; Accepted: 19 June 2019)

### Abstract

**Introduction:** High blood pressure is one of the chronic medical conditions. The aim of this study was to investigate the mediating role of cognitive emotion regulation strategies in the relationship between mindfulness and perceived stress in patients with high blood pressure.

**Methods:** 216 individuals with hypertension who referred to medical centers in Tehran in 2018 were selected by convenient sampling method and participated in this study. Participants in the study completed Perceived Stress Scale (PSS), the Cognitive Emotion Regulation Questionnaire (CERQ), and the Five Facets Mindfulness Questionnaire (FFMQ). For data analysis, Pearson correlation and path analysis were used by AMOS 22.0 software to examine the fitness of the proposed model and path analysis.

**Results:** The results showed there is a significant negative correlation between the adaptive cognitive emotion regulation strategies and mindfulness with perceived stress and positive correlation between the maladaptive cognitive emotion regulation strategies and perceived stress ( $p < 0.01$ ). The results of path analysis indicated that the indirect effect of mindfulness on perceived stress that was statistically significant through adaptive cognitive emotion regulation strategies (0.09) and maladaptive cognitive-emotional regulation strategies (0.11), respectively ( $p < 0.01$ ).

**Conclusion:** Based on the findings of this study, it can be concluded that the variables of mindfulness and adaptive cognitive-emotion regulation strategies contribute to the reduction of stress in people with hypertension, which in turn leads to prevention and control of blood pressure. It is necessary to consider these factors in health-related interventions related to blood pressure control.

**Declaration of Interest:** None

**Key words:** Stress, Emotion regulation, Mindfulness, Blood Pressure.

### Introduction

High blood pressure is one of the most important threats to human health, especially in developing countries, including Iran (1). High blood pressure is currently one of the most common chronic diseases (2). Genetic factors such as family history and environmental factors such as salt intake, obesity, alcohol consumption, as well as

psychological factors such as personality traits, stress coping style, self-esteem, and anger are risk factors associated with hypertension (3). Stress is one of the factors that alone, or in combination with other factors, plays an essential role in hypertension (4).

The phenomenon of stress refers to a tangible or mental reaction that is caused by a perception of the threat to the body's biological

balance (4, 5). Psychological stress emphasizes the perception and assessment of the potential damage caused by confronting the motivating environment experiences (5). Individuals experience stress or percept issues as threatening/dangerous whenever she/he cannot believe to have adequate resources to cope with such obstacles (6). Lazarus and Folkman's theory of psychological stress and coping stresses that events only affect those who evaluate them as stressful (7, 8). In fact, stress is not just the product of the environmental conditions or the response variables, but the product of the individual interpretations of their relationship with their peripheral environment (8). People usually evaluate events in different ways, and this makes some of them more vulnerable to the unpleasant consequences of stress (9). In fact, perceived stress refers to the extent to which people assess their life events as unpredictable, uncontrollable, and high-stressed (10). These three features have been introduced as core components of stress experience in various research studies. Therefore, according to Lazarus' view, individuals determine the stressfulness or non-stress of an event, and only stimuli that are evaluated as the stressor, cause stress response. For people under tension or stress, it's important to assess stress levels as well as stress coping methods (8, 10). Mindfulness is one of the variables that can affect perceived stress.

Mindfulness involves, by definition, a state of attentiveness and awareness of what is taking place in the present moment as it unfolds (11). Mindfulness is a moment-to-moment awareness of one's experience without judgment and with an orientation of acceptance (12). Highly mindful people freely perceive internal and external realities without distortion and have a great deal of ability to deal with a wide range of emotions and pleasant and unpleasant experiences (13). Mindfulness helps us to understand that negative emotions may occur, but they are not our permanent personality (14). It also allows an individual to respond to events to thinking and reflection and not automatically. Mindfulness meditation has been reported to produce beneficial effects on a number of

psychiatric, somatic function, and stress-related symptoms and has therefore increasingly been incorporated into psychotherapeutic programs (15, 16). This training in how to pay attention in a non-reactive, non-judgmental way is now well-established as beneficial for those suffering from chronic physical and mental health conditions (15, 17). A large body of research documents the efficacy of mindfulness-based interventions in the treatment of a number of clinical disorders, including anxiety (18), depression (19, 20), substance abuse (21), eating disorders (22), and chronic pain (20). Furthermore, mindfulness positively influences aspects of physical health, including improved immune function, reduced blood pressure and cortisol levels, and increased telomerase activity (13, 20). Not only has mindfulness successfully been used in the treatment of disorders and improvement of health; it has also been shown to produce positive effects on psychological wellbeing in healthy participants and to enhance cognitive functioning (18, 21, 22). Emotion regulation strategies are among the variables that seem to have a mediator role in the relationship between mindfulness and perceived stress.

Emotion is considered as a bio-cognitive reaction to important or challenging situations in life that have an important role in adapting to life changes and stressful events (23). The ability of emotion expression by a person is called emotional regulation. Gross suggests that emotion regulation refers to the process of influencing emotions, experiences, and expressions and help with one's awareness and ability to understand emotions, accept emotions, ability to control impulsive behaviors and behave according to desired goals to achieve personal and conditional goals (23, 24, 25). More generally, emotion regulation involves the change of emotional latency, time, duration, behavior expression, psychological experience, physiological response, etc. (25). The cognitive way of managing the intake of emotionally arousing information (23), or cognitive emotion regulation, could occur through more unconscious processes, as selective attention, or through more conscious processes, as

rumination or self-blaming (24). It is identified nine types of cognitive emotion regulation strategies, namely positive reappraisal, positive refocusing, putting into perspective, planning, acceptance, rumination, catastrophizing, self-blame and other blame (26). These strategies mainly involve the conscious, relatively psychological styles individuals use to deal with negative events in their lives (27). Nevertheless, the systematic use of maladaptive cognitive emotion regulation strategies (26) and the failure in developing emotion regulation abilities can play an important role in the beginning and exacerbation of negative psychological symptoms (28). In certain situations people may use specific cognitive emotion regulation strategies, which may differ from other strategies that could be used in other different contextual situations. Such cognitions and thoughts might be keys in their ability to regulate emotions, and not be overwhelmed by them, during stressful life events (29).

High blood pressure is one of the progressive chronic diseases and it is necessary to identify the factors involved in the disease in order to develop program and protocols for the prevention and treatment of it. According to the findings of studies, psychological stress is one of the factors influencing high blood pressure. It seems that mindfulness attention in a purpose way, the present moment, and without judgment can probably act as an effective stress adjustment. On the other hand, emotional regulation can also help reduce stress. The question now is whether the emotion regulation can play a mediator role in the relationship between mindfulness and perceived stress in patients with high blood pressure, and this study seeks to answer this question.

## Method

The cross-sectional study was performed in 2018. The sample populations were consisted of 216 patients with high blood pressure who referred to medical centers in Tehran using convenient sampling method. There were 102 women (47%) and 114 men (53%) aging 40 to 75 years old ( $M = 58.27$ ;  $SD = 7.61$ ). Patients were considered to have hypertension if they

had previously known hypertension, or if they were on antihypertensive therapy, or if they had a systolic blood pressure of  $\geq 140$  mmHg and a diastolic blood pressure of  $\geq 90$  mmHg.

## Instruments

### *Perceived stress scale (PSS, Cohen, (30)):*

The PSS-10 is a self-report instrument consisting of 10 items purported to assess "how unpredictable, uncontrollable, and overloaded respondents find their lives". Each of the items on the PSS-10 are rated on a 5-point Likert scale, ranging from 0 (never) to 4 (very often). The PSS-10 consisted of 6 positively (items 1, 2, 3, 6, 9 and 10: Positive factor) and 4 negatively (items 4, 5, 7 and 8: Negative factor) worded items. Negative worded items were re-coded during analysis. Total scores range from 0 to 40, with higher scores indicating higher levels of perceived stress (30). It is found satisfactory Cronbach's alpha value (0.82 for the full scale) for PSS-10 (31). PSS score exhibited high correlation coefficients with DASS-21 subscales scores, meaning stress ( $r = 0.64$ ), depression ( $r = 0.61$ ), and anxiety ( $r = 0.54$ ) (31).

### *The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. ):*

FFMQ served as our measure of trait mindfulness. The measure includes 39-items that are rated on a 1 to 5 point Likert-type scale assessing five facets (32). The FFMQ has several strong psychometric features (33). Internal consistency reliability estimates for the FFMQ in the current sample were adequate:  $\alpha = 0.89$ , 0.92, 0.89, 0.79, 0.80, and 0.92 for Acting with Awareness, Describe, Non-judge, Non-react, Observe, and total scores respectively. All five subscales as well as a total score composed of all items were used in analyses. A higher score on the FFMQ indicates higher levels of mindfulness.

### *Cognitive Emotion Regulation Questionnaire (CERQ, Garnefski, Kraaij & Spinhoven).*

CERQ is a self-report questionnaire used to assess specific cognitive emotion regulation strategies that adolescents can use when facing negative life events (26). It has 36 items that can be answered using a Likert scale ranging from 1 (almost never) to 5 (almost always). CERQ has 9

subscales that match nine cognitive emotional regulation strategies: self-blame, thoughts of blaming oneself for the event; rumination, thinking about the feelings and thoughts associated with the event; catastrophizing, thoughts of emphasizing the terror of the situation; other-blame, thoughts of putting the blame of what happened on others or in the context; acceptance, thoughts of accepting what one has

of the variables. For the inferential statistical evaluation of structural equation modeling (SEM), we calculated the indices of goodness of fit, such as the Goodness of Fit Index (GFI), Adjusted GFI (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). According to the conventional criteria, GFI greater than 0.90, AGFI greater than 0.85, CFI greater than 0.95, and RMSEA less than 0.08 indicate an

Table 1. Description and correlation coefficient among variables

Variable	M	SD	1	2	3	4
1. Perceived stress	39.52	8.11	1			
2. Adaptive cognitive emotion regulation	30.48	7.52	-.22**	1		
3. Maladaptive cognitive emotion regulation	23.36	5.09	.28**	-.24**	1	
4. Mindfulness	113.26	26.32	-.31**	.14*	-.37**	1

experienced and resigned to what has happened; positive reappraisal, thoughts of attaching a positive meaning to the situation in terms of personal growth; refocus on planning, thinking about what steps to take in order to handle the negative event; putting into perspective, thoughts of playing down the seriousness of the event and emphasizing its relativity comparing to other events; positive refocusing, referring to thinking about joyful and pleasant events instead of thinking about what happened (26, 27). In CERQ's original study, alpha coefficients ranged from 0.68 to 0.83 (26). In the present study, alpha coefficients ranged from 0.68 (other-blame) to 0.83 (rumination) (26, 27).

**Statistical Analysis**

Pearson correlation coefficient was used for correlation analysis between variables. By designing a structural equation model, in which perceived stress was predicted by emotion regulation and mindfulness. We used AMOS 21.0 to perform this path analysis to obtain the direct and indirect effects among all

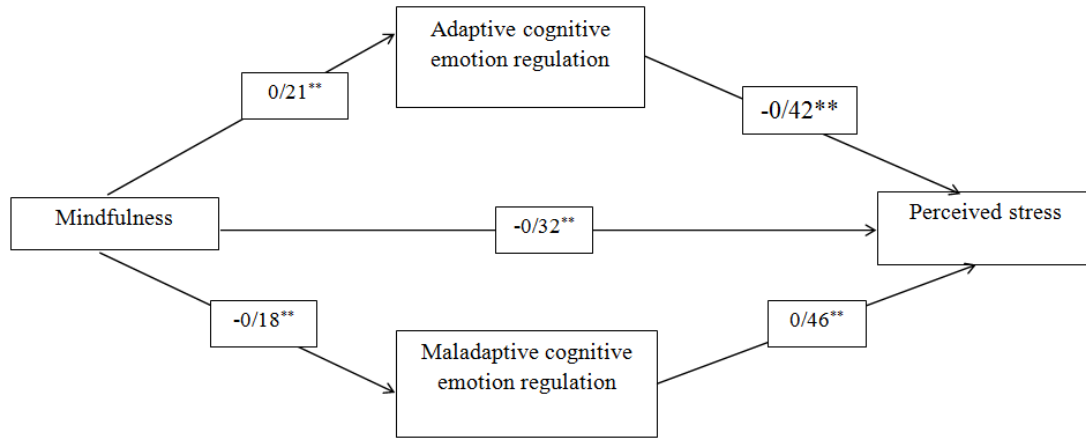
acceptable fit; GFI greater than 0.95, AGFI greater than 0.90, CFI greater than 0.97, and RMSEA less than 0.05 indicate a good fit (34).

**Results**

Table 1 provides description of variables of the study include the emotion regulation, mindfulness and perceived stress for the participants. Also, bivariate correlation coefficients between variables are shown in table 1. The results showed that there is a significant negative correlation between adaptive cognitive emotion regulation and mindfulness with perceived stress (P<0.01).

\*p<0.05; \*\*p<0.01

To examine the causality of all of the variables, we built a structure equation model based on the results of the above correlation analysis (Fig. 1). The results of the path coefficients calculated by AMOS are shown in Fig. 1. A good fit of the model was obtained as follows: RMSEA = 0.071, GFI = 0.922, AGFI = 0.907, CFI = 0.963.



**Figure1.** The mediating effects of cognitive emotion regulation in the relationship between mindfulness and perceived stress

According to Table 2, all of the path coefficients were substantially significant ( $p < 0.01$ ). Since one of the path analysis objectives is the indirect effect of independent variables on dependent variables, in addition to the direct effect, the indirect effect of the independent variable on the dependent

variable is shown in Table 2. As can be seen, the indirect effect of mindfulness on perceived stress was significant through adaptive cognitive emotion regulation (0.09) and maladaptive cognitive-emotion regulation, respectively.

**Table2.** Standardized and non-standardized coefficients of the direct and indirect paths of mediating role of cognitive-emotion regulation in the relationship between mindfulness and perceived stress

Paths	B	$\beta$
Direct effect of mindfulness on adaptive cognitive emotion regulation	0/51**	0/21**
Direct effect of mindfulness on maladaptive cognitive emotion regulation	-0/44**	-0/18**
Direct effect of mindfulness on perceived stress	-0/58**	-0/32**
Direct effect of adaptive cognitive emotion regulation on perceived stress	-1/13**	-0/42**
Direct effect of maladaptive cognitive emotion regulation on perceived stress	0/72**	0/46**
Indirect effect of mindfulness on perceived stress through adaptive cognitive emotion regulation	-0/25**	-0/09**
Indirect effect of mindfulness on perceived stress through maladaptive cognitive emotion regulation	-0/38**	-0/11**

We used the bootstrapping procedure to test indirect effects. The bootstrapping resampling technique is used to create bias-corrected 95% confidence intervals (95%CI) for the indirect effects of the mediating variable. If the interval does not include zero, then the effect is significantly greater than zero and considered to be a good mediator for the model. The bootstrapped estimate of the indirect effect of

adaptive cognitive emotion regulation was significantly different than zero (95%CI between - 0.2811 and - 0.0632), indicating that adaptive cognitive emotion regulation was a good mediator of the relationship between mindfulness with perceived stress. The bootstrapped estimate of the indirect effect of maladaptive cognitive emotion regulation was significantly different than zero (95%CI

between 0.1008 and 0.2174), indicating that maladaptive cognitive emotion regulation was a good mediator of the relationship between mindfulness with perceived stress.

### Discussion

The results of this study showed that there is a negative relationship between mindfulness and perceived stress in patients with high blood pressure. This result is consistent with previous research findings (14-18). It was also shown that perceived stress has a negative correlation with adaptive cognitive emotion regulation and a positive correlation with maladaptive cognitive emotion regulation, which is consistent with the findings of the studies (25-30). It was also shown that cognitive emotion regulation can have a mediator role in the relationship between mindfulness and perceived stress.

The stress factor contributes to hypertension in different ways. Physical and mental stresses stimulate neuro-hormonal pathways, specifically hypothalamic-pituitary-adrenal axis. Catecholamine and glucocorticoid axes affect structure and function of specific tissues, resulting in cytokine secretion. Cytokine basically causes stress oxidative and inflammation processes through interleukin 6, which results in cardiovascular complications such as atherosclerosis (5, 7). Stress can also be associated with disturbances in the behavioral system and the appearance of unhealthy behaviors, including reduced physical activity, inappropriate diet, over consumption of alcohol, smoking, and lack of use of medications (6, 7).

On the other hand, studies have shown that emotional dynamics are associated with well-being (23-25). For example, frequent use of reappraisal has been found to be related with beneficial outcomes such as greater psychological and physical well-being, reduction in stress, and improved interpersonal functioning (35). After all, individuals who habitually use reappraisal experience higher subjective well-being because the key function of reappraisal is to diminish negative emotions such as stress (9). In contrast, frequent use of expressive suppression has been found to be related to more depressive symptoms,

diminished well-being, increased stress, and lower interpersonal functioning.

Research also has examined the relationship between mindfulness meditation practices and psychological well-being. Lykins (36) compared meditators and non-meditators on several indices of psychological well-being. Meditators reported significantly higher levels of mindfulness, self-compassion and overall sense of well-being, and significantly lower levels of psychological symptoms, rumination, thought suppression, fear of emotion, and difficulties with emotion regulation, compared to non-meditators, and changes in these variables were linearly associated with extent of meditation practice. Mindfulness has been shown to be related not only to psychological health, but also to differences in brain activity. Creswell, Way, Eisenberger, and Lieberman (37) found that trait mindfulness was associated with reduced bilateral amygdala activation and greater widespread prefrontal cortical activation. There was also a strong inverse association between prefrontal cortex and right amygdala responses among those who scored high on mindfulness, but not among those who scored low on mindfulness, which suggests that individuals who are mindful may be better able to regulate emotional responses via prefrontal cortical inhibition of the amygdala. In explaining the mechanism of mind-awareness that is useful in promoting health and reducing stress, it should be stated that mindfulness encompasses two components: self-regulation of attention, and adoption of a particular orientation towards one's experiences (17, 19). Self-regulation of attention refers to non-elaborative observation and awareness of sensations, thoughts, or feelings from moment to moment. It requires both the ability to anchor one's attention on what is occurring, and the ability to intentionally switch attention from one aspect of the experience to another. Orientation to experience concerns the kind of attitude that one holds towards one's experience, specifically an attitude of curiosity, openness, and acceptance. To sum up, current conceptualizations of mindfulness in clinical psychology point to two primary, essential elements of mindfulness: awareness of one's

moment-to-moment experience nonjudgmentally and with acceptance. Mindful people know that thoughts are just thoughts, and are alert and sensitive to the destructive nature of those thoughts that cause fear of failure and disappointment (37). As a result, a person who is more aware of his unpleasant thoughts and emotions is less affected by them. Also, from the physiology aspect, mindfulness exercises are associated with a reduction in the experience of negative and intense emotions and this process can lead to cortisol regulation and other stress hormones (16).

In summary, the findings of this study showed that in patients with hypertension, psychological stress has an inverse relationship with adaptive emotion regulation strategies and mindfulness. These findings can be used to design therapeutic and preventive programs of high blood pressure. Limitations of this study include its cross-sectional design and reliance on self-report measures. In addition, the sample consisted of high blood pressure patients in at Tehran City; thus, results may not be generalizable across individuals of different age groups, socioeconomic levels, and geographic regions.

### Acknowledgements

The authors are thankful to all the participants who participated in this study and helped facilitate the research process.

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